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ABSTRACTS

of presentations (contributed papers, poster and film sessions) at the Thirteenth Annual Conference of the Society of Ethnobiology Arizona State University, Tempe, Arizona 21-24 March 1990

Karen R. ADAMS, Crow Canyon Archaeological Center, Cortez, Colorado

A REVIEW OF ANCIENT TOBACCO *(NICOTIANA)* USE IN THE PREHISTORIC SOUTHWESTERN UNITED STATES

Recent large scale archaeological projects that utilize flotation techniques to recover plant parts have broadened our understanding of ancient tobacco distribution among Anasazi, Mogollon and Hohokam cultures. Species identified include *Nicotiana attenuata, N. trigonophylla* and the domesticates *N. rustica* and *N. tabacum*. Both charred and uncharred parts, especially the seeds and stems, are reported. Contexts of recovery include floors, various pits, hearths and other thermal features, and inside ceramic vessels and "reedgrass cigarettes." The tobacco parts occur in Anasazi and Mogollon sites dating as early as the period A.D. 500–700, and in Hohokam sites dating to the A.D. 900's. Attempts to identify seeds on the basis of size, shape and surface reticulation patterns may be hampered by our incomplete knowledge of possible overlap of the characteristics between species. To provide secure species identifications we must provide detailed descriptions of all tobacco parts recovered from ancient sites, as well as study normal and charred modern populations to perceive both the average and the range of characteristics expressed.

Janis ALCORN, AAAS Fellow, Agency for International Development, Washington, D.C.

THE RELATIONSHIP BETWEEN BIODIVERSITY CONSERVATION, ECONOMIC DEVELOPMENT, AND GROSS NATURE PRODUCT

The challenge of making ethnobiological information relevant to policy makers and planners is formidable. The need for biodiversity conservation on two fronts (natural ecosystems and human-dominated ecosystems) is not appreciated by most planners. Interest in the economics of sustainable development is currently high, but the relationship between 1) contributions of biota to local economies and 2) national economic stability and growth is not widely appreciated. The concept of "Gross Nature Product" was coined by Anil Agarwal. I will explore the Gross Nature Product concept using examples from Mexico and India. It is a potentially powerful vehicle to inform development planners about the economic importance of biodiversity management in rural, human-dominated landscapes.

Rosalia ALVAREZ, Carlos ALVARES and Julio RUIZ
Escuela Nacional de Antropologia e Historia, INAH, Mexico City, Mexico
AN OBSIDIAN WORKSHOP WITH BOTANICAL REMAINS: THE CENTRAL PLAZA OF MEXICO CITY

The Archaeological Recovery Department of INAH initiated studies of the Plaza of the Nationalized Bank in 1986. It discovered an interesting obsidian workshop of the Aztecs below this central plaza. The plaza had been built over an ancient agricultural ''chinampa'' raised field. The obsidian matrix holds within it many different elements: Aztec pottery fragments; charcoal; bone; insects; shells of aquatic invertebrates; and botanical remains. The botanical remains include seeds of wild, weedy and cultivated plants that enable the reconstruction of culture/environment interrelations, diets and microenvironments. The lacustrine habitat included *Scirpus, Cyperus, Polygonum, Hydrocotyle, Nymphaea* and *Ruppia,* the latter a halophyte. The terrestrial (raised field) habitat included *Zea, Cucurbita, Chenopodium, Physalis, Solanum, Amaranthus* and *Oxalis.* Gradual salinization is indicated by the take-over of basin habitats by *Suaeda, Sesuvium* and *Portulaca.*

E.N. ANDERSON, University of California, Riverside, CA
NOTES ON DOORYARD GARDENS

Comparative research (funded by University of California) on southeast Asian and southeast Mexican dooryard gardens is now under way. Preliminary results show considerable similarity in dooryard garden structure and function in these two areas. Species have been exchanged in both directions, leading to great similarity of the gardens. These gardens offer great potential for improving the life of poorer rural families.

M. Kat ANDERSON, Department of Forestry and Resource Management, University of California at Berkeley, Berkeley, CA
CALIFORNIA INDIAN HORTICULTURE: REDBUD MANAGEMENT AND USE BY THE SOUTHERN SIERRA MIWOK

A survey of California ethnohistoric literature and ethnographic interviews reveal that historically California Indians had an active role in manipulating the plant architecture of redbud *Cercis occidentalis* Torr. ex Gray with coppice and fire management to make the branches suitable for basketry material. This offers evidence that hunter-gatherers practiced horticulture in California plant communities. Results from a study conducted in Sierra National Forest which quantifies the regeneration of redbud in response to ''mimicked'' management practices of the Southern Sierra Miwok are reported. Personal observations regarding the generous presence of redbuds in proximity to major Southern Sierra Miwok archaeological sites suggest that some element of human activity was responsible for the successful regeneration of redbud at these sites. It is proposed that the introduction of anthropogenic fire, pruning, and weeding historically maintained and enhanced populations of redbud, extending its range and distribution.

Aleandro DE AVILA, Instituto Tecnologico de Oaxaca, Oaxaca, Mexico
CORN AND OPIUM IN A CLOUD FOREST OF SOUTHERN MEXICO

Indigenous communities of the Sierra Madre del Sur in the state of Oaxaca and Guerrero, Mexico, live in an extremely diverse environment ranging from 500 to 3000m above sea level. Various subsistence crops are planted at different altitudes, mostly in slash and burn plots. The majority of families are unable to grow enough to feed themselves, and rely on goat herding, migrant labor, and increasingly drug cultivation to obtain cash to buy corn. I describe in this paper corn and opium agriculture in the area of Coycoyan, Oaxaca, and discuss some apparent effects of the opium trade on Mixtec culture. I denounce indiscriminate violence and other abuses committed against the Mixtec communities in the name of drug enforcement.

Frank E. BAYHAM, California State University, Chico, CA
AN EXPERIMENT IN INTERDISCIPLINARY INSTRUCTION: A ZOOARCHAEOLOGY FIELD COURSE

Adequate training and instruction in zooarchaeology has long been confounded by the interdisciplinary nature of the field. Knowledge of vertebrate osteology and life history strategies, while essential, is not sufficient to meet the theoretical and methodological challenges of modern archeaological background focusing on the inherent complexity of cultural systems and human behavior is generally neglectful of complex ecological relationships which may influence variability in the archaeological record. In an effort to help rectify this situation, a field course in zooarchaeology has been developed to break down the disciplinary automony which constrains student development. The goals and format of this course which integrates zooarchaeological identification techniques and field ecology at the Eagle Lake Biological Field Station are discussed.

Vorsila L. BOHRER, Southwest Ethnobotanical Enterprises, Portales, NM
THE PATH OF THE SUN IN RELATION TO MAIZE PLANTING RITUAL

Planting dates and planting prayers to the "four corners" among the Pueblo Indians and in diffuse locations in Mesoamerica derive from perceptions of the yearly paths of the sun. The impression of the daily path of the sun is expressed in spiral counter-clockwise planting. Archaeological evidence suggests the organizing conceptions from which such customs originate predate A.D. 300 (the Classic) in Mesoamerica.

Jannette BRAND, B. Janelle SNOW, A. Stewart TRUSWELL,
University of Sydney, Sydney, Australia, and
Gary P. NABHAN, Desert Botanical Garden, Phoenix, AZ
HYPOGLYCEMIC EFFECTS OF NATIVE DESERT FOODS OF THE RIVER PIMA: PROTECTION FOR A DIABETES-SUSCEPTIBLE POPULATION?

The River Pima (Akimel O'Odham) tribe of arid, central Arizona has the highest documented prevalence of adult-onset diabetes (NIDDM) of any ethnic

group in the world. Up to 35% of their adult population develop this nutrition-related disease, but this high prevalence has developed since the 1940s as a result of dietary acculturation. In this study, six staple foods traditionally consumed by the Pima were analyzed for their invitro glycemic, insulin reponses, and invitro starch digestibility: 60 day flour corn, lima beans, white and yellow tepary beans, mesquite and Emory oak acorns. The calculated glycemic indices were all low, ranging from 16 ± 2 for acorns to 40 ± 5 for corn. Other traditional Pima foods, including chia, prickly pear pads and fruit, and plantago contain hygroscopic mucilages which also appear to have hypoglycemic effects. We hypothesize that desert floras may be relatively rich in plant foods which contain such hypoglycemia mucilages which slow sugar absorption and digestion, because these same mucilages retard water loss in seedlings or established plants. We also hypothesize that the slow digestibility of native foods protected the Pima and other desert Indians from developing diabetes.

Carol B. BRANDT and Patricia A. RUPPE',
Zuni Archaeology Program, Zuni, NM
WOOD USE IN THE ZUNI RIVER VALLEY: THE ARCHAEOBOTANICAL DATA

A model for local deforestation proposed by Kohler and Matthews (1988) is applied to the charred wood data from 16 archaeological sites in the Zuni River Valley. These data provide insight into local patterns for selection for firewood and construction timbers from Basketmaker III through Late Historic periods (AD 400–1900). Overall, the charred wood data reflect current environmental conditions where conifers dominate the vegetation of Zuni River Valley. Post-AD 1000, however, the frequency of shrubby wood used for fuel increases in the archaeobotanical assemblage. This change in wood use is compared to tree-ring data, plant use, and palynological studies in the Zuni River Valley.

Barrett P. BRENTON, University of Massachusetts, Amherst, MA
USE OF FERMENTED FOODS AMONG NATIVE NORTH AMERICANS: ETHNOHISTORIC AND ETHNOGRAPHIC PERSPECTIVES

The use of fermented foods among Native North Americans can be viewed as one in a series of technological innovations responding to or creating a change in subsistence activities. In turn, an understanding of human-plant interactions and horticultural activities cannot be complete without incorporating the role of microorganisms. The fermentation of a foodstuff can alter the storability, nutritional quality, organoleptic properties (smell, taste, texture, appearance), and the medicinal potential of foods. This paper reviews the use of fermented foods from ethnohistoric and ethnographic perspectives. This information is then used to infer the importance of food fermentations to the health and nutrition of Native North American Populations, which to date has been given little or no attention. In addition, further avenues for investigating the nature of prehistoric and indigenous/traditional fermentations are discussed.

Carmen BURCH, Connecticut College, New London, CT
SEEDS AND DEEDS IN THE ASIAN TROPICAL FOREST: TO MAKI CULTIVATION PRACTICES AND CROP DIVERSITY

Polycultural systems of traditional farmers living in Asian tropical forests are considered to be valuable reservoirs of cultivar diversity, but there is a limited understanding of the ongoing process by which the store of plant varieties is selected, maintained or expanded. This paper, based on field research with upland forest cultivators on the island of Sulawesi (Indonesia), reports on the To Maki's knowledge and practices related to the management of plant resources, including attention to To Maki experimentation with unfamiliar varieties and the incorporation of new cultivars into cropping regimens. The To Maki handling of plant resources comments on the flexibility of traditional farmers in responding to short and long term changes and suggests a role for diversified cultivation systems in accommodating both conservation and development in tropical forest environments.

Martha Ames BURGESS and Kevin A. DAHL, Native Seeds/SEARCH, Tucson, AZ
YES, YOU CAN EAT THAT (AND YOU SHOULD!): NATIVE SEEDS/SEARCH'S EDUCATIONAL ACTIVITIES

Native Seeds/SEARCH is a non-profit conservation organization whose mission is to preserve the crops grown by Native Americans in the Greater Southwest. In large measure, its activities involve educating the public about the wonderful diversity of food plants grown in this region, including corn, squash, beans and others. Tools used to reach new audiences with this message include a slide-tape presentation, setting up booths at selected special events, a hands-on mini-museum, quarterly newsletter, an informative annual seed catalog, and workshops. Celebrations to mark the beginning and ending of the growing cycle have become educational events in themselves: our San Juan's Day Feast heralds the traditional summer planting season and La Fiesta de los Chiles observes the harvest. The success of this multi-level educational approach can be measured by the healthy growth of the organization in recent years.

Robert BYE and Edelmira LINARES, Jardín Botánico, Universidad Naçional Autonoma de México, México, DF
ETHNOBOTANY OF MARKETS IN EL BAJIO, GUANAJUATO, MEXICO

El Bajio has been the most fertile agricultural region in Mexico since Spanish colonization in 1540 A.D. The intense agro-industrial development and the migration of laborers to and from the USA have changed traditional plant-human interactions. A study of local markets with emphasis on medicinal and edible plants documents 141 useful species with reports of 95 being medicinal, 103 edible, 11 beverages and 10 condiments. Plant management systems include "huamiles" (dry, rock agricultural technique) and associated "monte," houseyard gardens

and irrigated specialty gardens. Cultivated plants transplanted from wild populations include *Achillea, Heterotheca & Jatropha*. Local domestication of various cacti *(Opuntia & Stenocereus)* have generated a wide variety of edible fruits. Typical Mexican medicinal plant complexes (e.g., toronjil, árnica, cola de caballo) are encountered. Although 15 bean varieties are cultivated locally, only 5 types imported from adjacent geoeconomic regions are sold in the market. Despite the drastic alterations of the socioeconomic structure of El Bajio, traditional ethnobotanical processes still function, usually in marginal areas.

Luis CERVANTES SERVIN and Robert BYE, Jardín Botánico
Universidad Nacional Autónoma de México, México, DF

USEFUL PLANTS OF THE CENTRAL AND SOUTHERN COAST OF JALISCO, MEXICO

The exploitation of deciduous tropical forests along the Pacific coast after the Spanish Conquest was limited due to annihilation of Nahuatl inhabitants and to the rugged terrain. After the Mexican Revolution of 1910, the areas was resettled by immigrants from Jalisco and adjacent states. Dramatic changes have occurred on both private and communal lands after the construction of the federal coastal highway in 1970. Open interviews and questionnnaires were conducted with the assistance of 266 individuals (56 adults and 210 children between the ages of 14 and 56) of different socioeconomic levels. The distribution of the 153 useful species in 64 families according to the most common use categories are: medicinal (41.9%), edible (19.2%), construction (14.15%) and fuelwood (4%). Since most of the inhabitants families have occupied the area for two or less generations, it is not surprising that most of the cultivated plants are exotic. Nonetheless, manipulation of contrasting forms with native species (e.g. *Dioscorea nelsonii* Uline ex Kunth) does occur. The proportion of utilized wild species by plant families corresponds to the dominant taxa of the local flora.

David A. CLEVELAND and Daniela SOLERI, Center for People, Food and Environment, Tucson, AZ

FOOD FROM DRYLAND GARDENS

This poster displays excerpts from research on small scale household food production in the world's drylands. The focus has been the complementarity of local or indigenous knowledge and basic "scientific" principles for supporting food gardens in those areas. Both approaches are based on experimentation and observation, but reflect different attitudes and resources. Indigenous techniques from diverse drylands illustrate plant, soil, and water management which is uniquely suited to the needs of the gardeners and their environment. Excerpts and line drawings from a newly published book of the same name are used along with some additional photographs of indigenous household gardens.

David A. CLEVELAND and Daniela SOLERI, Center for People, Food and Environment, Tucson, AZ

CULTURAL AND BIOLOGICAL DIVERSITY IN AGRICULTURE: WHO NEEDS IT?

The debate over the function of human cultural diversity and crop genetic diversity in agricultural systems often produces more heat than light. This is because of the failure to distinguish between issues of fact and issues of value. The former are subject to evaluation through traditional positivist scientific procedures. While values are affected by the objective environment, they are embedded within cultural systems and can only be understood as components of those systems. Data show that biological diversity enhances yield stability at the cost of relatively low production. Increasing production with the use of modern crop varieties reduces crop genetic diversity and increases variance and covariance in annual yields. Data on the relationship between cultural and crop genetic diversity and stability suggests a positive correlation. Choices between diversity and stability are not based on data alone, but also on values which are not articulated or even appreciated by decision makers. Understanding the cultural and historical context of these values and their social and ecological implications for the future can shed more light on the choices.

Kevin A. DAHL, Native Seeds/SEARCH, Tucson, AZ

CORN SOOT WOMAN'S TIMELESS LESSON: EAT YOUR SMUT

A Cochiti Pueblo (New Mexico) folktale that encourages women not to discard maize afflicted with corn smut (*Ustilago maydis* D.C.) might be puzzling to most non-native farmers and gardeners in the U.S. who treat this fungus as a repugnant pest. A survey of studies of southwestern Native American food sources shows that corn smut was enjoyed as food and used for medicine and other purposes. In southern Mexico, *cuitlacoche* (corn smut) is both a traditional food and a highly praised gourmet item, available fresh in season as a market vegetable and year-round as a canned food. The author proposes that the U.S. has rejected corn smut as food because it simply rejects most fungal foods, and that there were unfounded concerns about its toxicity. Based on *cuitlacoche's* success in Mexico City's *nueva cocina Mexicana,* corn smut may find acceptance as a new ingredient for southwestern *nouvelle cuisine.*

Frank DIRRIGL, Jr., University of Connecticut, Storrs, CT

ETHNOZOOLOGY AS AN AID TO BAT CONSERVATION

The conservation of bats has received increased attention because of the important ecological role of bats in the environment. Through open-ended interviewing, students at the University of Connecticut were sampled for their "bat knowledge" and "bat attitude." Content analysis of informant interviews was performed to determine what knowledge was shared. Subjects were ranked according to their ethnographic descriptions and attitudes regarding bats to deter-

mine why a person may like or dislike bats. This study emphasizes the utility of and need for ethnozoological studies in designing public information pamphlets to promote the conservation of animals such as bats.

W. Hardy ESHBAUGH, Department of Botany, Miami University, Oxford, OH

KEEPERS OF THE FOREST

Keepers of the Forest examines agriculture and forestry practices as well as settlement patterns among the Lacandon Maya in Chiapas, Mexico and their effect on the tropical rainforest. The film is a major contribution in the area of conservation biology and provides an overview of what an indigenous people's knowledge of the rainforest and specific agricultural techniques can teach us about the management of one of the earth's most fragile ecosystems. Norman Lippman produced this 28 minute VHS video tape that is distributed by Umbrella Films, Brookline, MA. W. Hardy Eshbaugh wrote the accompanying study guide.

Suzanne K. FISH and Paul R. FISH, Arizona State Museum, University of Arizona, Tucson, AZ

REGIONAL AND ECONOMIC CONTEXTS OF HOHOKAM AGAVE CULTIVATION

A new appreciation of the scale of agave cultivation by the prehistoric Hohokam in southern Arizona has emerged from a substantial body of recent archaeological work. Environmental variability across Hohokam territory appears to correlate with aspects of variability in technological and organizational parameters of production. Large scale distributions of farming methods and settlement suggest that Hohokam agave cultivation can be understood within a framework of economic decision-making and alternative opportunities.

Suzanne K. FISH and Thomas SHERIDAN, Arizona State Museum, University of Arizona, Tucson, AZ

FARMING IN CURCURPE: A CONVERSATION WITH ADALBERTO CRUZ

Most small scale farmers in Curcurpe, Sonora, Mexico, follow a traditional agricultural strategy that combines riverine irrigation, runoff, plantings in arroyos, and cattle grazing on communal lands. The life of a farmer is revealed through conservation between Adalberto Cruz and anthropologist Thomas Sheridan, whose research in the area spans more than 10 years. Interspersed with this conversation are views of the setting and agricultural technology. We learn how such traditional farmers cope with their environment, neighbors, and the larger world.

Arlene FRADKIN, Florida Museum of Natural History, Gainesville, FL
COMBINING FOLK BIOLOGICAL AND ZOOARCHAEOLOGICAL STUDIES: A METHODOLOGY

Folk biological studies of past human populations involve an examination of linguistic, oral tradition, and ethnographic/historical data recorded in early written sources. Reconstruction of animal semantic domains is carried out in four analytical stages: nomenclature, cultural significance, classification, and synthesis. Results from these analyses can serve as a basis for developing implications pertaining to zooarchaeological studies. Examples from the animal semantic domain of the protohistoric Cherokee Indians of the Southeast United States are used to demonstrate the application of the methodology.

Leslie M. Johnson GOTTESFELD, GCON, Kitwanga, British Columbia
ABORIGINAL USE OF BARK PRODUCTS IN NORTHWESTERN BRITISH COLUMBIA

The landscape of northwestern British Columbia is largely covered with conifer forests. Bark products were used to fill many needs which in less heavily forested environments were filled by herbaceous plants. The products of the bark of woody shrubs and trees formed an important part of the aboriginal economies of the Gitksan, Wet'suwet'en and Haisla people until the early twentieth century. Bark from woody shrubs and trees was used for nutrition, healing, fibre, and structural material. Cambium from western hemlock and lodgepole pine were important carbohydrate sources. In coastal areas, black cottonwood and amabilis fir cambium were also eaten. Bark and cambium from a wide variety of trees and shrubs were used for medicinal decoctions and as poultices. Cedar bark and willow bark were the most important sources of fibre and cordage. At the present time, most of the products formerly derived from the barks of woody shrubs and trees have been replaced with manufactured and agricultural products. To a small extent bark and cambium products continue to be gathered and utilized, especially for medicine. The most important bark product presently utilized is devil's club inner bark.

William GREEN, Office of the State Archaeologist, University of Iowa
CENTRAL PLAINS TRADITION PLANT AND ANIMAL USE: ANALYSIS OF A NEBRASKA PHASE EARTHLODGE IN WESTERN IOWA

The Glenwood "culture" of the Nebraska phase is a unit of the Central Plains tradition that is located east of the Missouri River. Glenwood communities are characterized by dispersed earthlodges situated within the highly dissected Loess Hills landform region adjacent to the Missouri River Valley. The excavation of the Wall Ridge site (13ML176) was the first at which Glenwood soil samples were systematically and stratigraphically collected and processed through flotation (0.425 mm mesh). The site therefore offers the first opportunity for a comprehensive assessment of Nebraska phase subsistence practices. Native cultigens

(e.g., *Hordeum pusillum)* and wild fruits (e.g., *Sambucus canadensis)* supplemented maize; mussels and large numbers of fish were collected from all nearby aquatic zones; and a wide range of mammals provided much of the household's food supply. Comparisons with coeval Central Plains, Initial Middle Missouri, and Oneota economic systems suggest that Glenwood people maintained Eastern Woodlands-like subsistence behaviors as a major element of their successful, long-lived adjustment to their distinctive habitat.

Eusebio HERNANDEZ RAMON, Direccion General de Culturas Populares, Unidad Regional Oaxaca, Mexico

A PHARMACOPOEIA AND FOOD SURVEY OF CHINANTLA ALTA, OAXACA, MEXICO

This is a study of the medicines and foods used by the Chinantec people in the community of La Esperanza, Comaltepec in the Northern Sierras of Oaxaca. More than 30 recipes are described as part of the diet of this particular ethno-culinary group. The relationship of the culture to the natural history of the sierra is reviewed.

K. Kris HIRST and Robert G. THOMPSON, Office of the State Archaeologist, University of Iowa

SHELL GAMES: SILICA DEPOSITS ON NAIAD SHELL CORN SHELLERS

Ethnographic evidence of the use of freshwater naiad shells for the removal of corn kernels from cobs prior to drying and storage has been documented for several historic American Indian groups, including Algonkian, Siouan, and Caddoan speakers. Formal analogues to such tools have been found in archaeological collections from central plains earthlodge sites. Opal phytoliths and amorphous mineral deposits resulting from the processing of plant material have been found on these artifacts. Similar deposits have been produced on experimental naiad shell implements used to remove corn kernels.

Phyllis HOGAN, Executive Director/Founder and Theresa BOONE, Education Coordinator
Arizona Ethnobotanical Research Association, Flagstaff, AZ

ETHNOBOTANY AND BILINGUAL EDUCATION

In remote and inaccessible areas of Indian reservations in Arizona, the Arizona Ethnobotanical Research Association has documented hundreds of beneficial plants. We will discuss the origin of the A.E.R.A. and our role in environmental education as it pertains to ethnobotany. As educators, we have incorporated ethnobotany projects into a multidisciplinary approach to cultural heritage preservation in elementary and secondary schools. By utilizing the outdoor environment as a classroom, the A.E.R.A. program emphasizes the students' culture and community as the laboratory of learning. Developing herbaria for students and teachers is done with the assistance of venerated tribal elders.

Eugene HUNN, University of Washington, Seattle, WA
HOW SIZE CONSTRAINS THE RECOGNITON OF FOLK BIOLOGICAL DATA

Constraints governing the recognition of basic level biological taxa in folk classifications have been characterized as either "perceptual" or "cultural." I suggest here that the perceptual salience of taxa involves two independent factors, phenotypic salience and size, while cultural salience involves ecological and other cultural factors. I evaluate the significance of size by plotting the average length/height (scaled logarithmically) of organisms of various sampling units against the scientific species recognition ratio (SSRR) for each such unit within a domain. Results from more than 20 domains representing some ten languages show weak to very strong positive correlations. Scatterplots for each domain clearly highlight "deviant" sampling units that require special attention to ecological and cultural factors. Reasons for the variation in correlation strength between these two variables is discussed.

Steven R. JAMES, Department of Anthropology, Arizona State University, Tempe, AZ
COMMENTS ON BUTCHERING STRATEGIES AND MEAT WEIGHT ESTIMATES USING EXAMPLES OF PREHISTORIC HOHOKAM HUNTING PATTERNS: WHERE'S THE BEEF?

Meat weight calculations and butchering strategies from ethnoarchaeological studies are reassessed in order to demonstrate how these data can be utilized for more accurately estimating protein-intake in prehistoric diets. In particular, Binford's Modified General Utility Index (MGUI) and a revised measure recently suggest by Metcalfe and Jones, that of the Food Utility Index (FUI), are evaluated and shown to be problematic. Modifications in these indices are used to examine butchering strategies and derive meat estimates for artiodactyl skeletal elements from several prehistoric Hohokam (ca. A.D. 700–1150) farmsteads and villages in the Sonoran Desert of southern Arizona.

Janice JUTILA, Brigham Young University, Provo, UT
ON ETHNOBOTANY OF RYUKYU ISLANDS

The Ryukyu islands, the southern-most islands of Japan, have a culture and language which differs from that of mainland Japan. In Okinawa, the largest island of the Ryukyu, medicinal plants and products are sold in open markets as well as in small family businesses and even in pharmacies. In the more recent history of Okinawa, specifically during World War II many Okinawans sought refuge in Taiwan. Medical provisions were scarce and many had to rely on plants for their medical care. Today, medicinal plants continue to be used by many Okinawan households.

Kelly KINDSCHER, University of Kansas, Lawrence, KS

MEDICINAL PLANTS USED BY INDIANS OF THE PRAIRIE BIOREGION

The ethnobotanical, anthropological, phharmacological, and historical literature of the Prairie Bioregion of North America was searched for references to the use of medicinal plants by the Indian tribes of the region. This search has resulted in finding that 20 tribes used 165 species of native plants for medicinal purposes. These tribes include the Lakota, Omaha, Comanche, Meskwaki, Kowa, and others, Representative ailments treated by each species are listed. This study is intended to encourage further ethnobotanical study in the region and the preservation, conservation, and restoration of native prairie remnants.

Frances B. KING, University of Pittsburgh, Pittsburgh, PA

POTENTIAL NATIVE CULTIGEN FROM A SITE IN EAST-CENTRAL PENNSYLVANIA

Current evidence suggests that native North American seed crops were grown primarily from Ohio westward. However, the Catawissa site (36Co9) in the Susquehanna River Valley in East-Central Pennsylvania yielded numerous carbonized seeds that appear to be wild barley *(Hordeum pusilum),* along with many other taxa, from features ranging in age from approximately A.D. 500 to A.D. 1100. Maize, beans, and squash are also present in younger features although several other cultigens, potential cultigens, and domesticates are absent. Wild barley is not native to Pennsylvania and its presence in this site suggests that it may have been filling a role similar to that of maygrass *(Phalaris caroliniana)* in portions of the Midwest.

Joseph E. LAFERRIERE, Charles W. WEBER, and Edwin A. KOHLHEPP, University of Arizona, Tucson, AZ

NUTRITIONAL VALUE OF MOUNTAIN PIMA FOOD PLANTS

Selected foods of plant origin consumed as food by the Mountain Pima of Chihuahua, Mexico, were analyzed for proximate and mineral nutritional content. Fruits of *Prunus gentryi, P. serotina* var. *virens, Berberis pimana, Jaltomata procumbens, Opuntia* spp., *Arctostaphylos pungens,* and *Arbutus xalapensis;* roots of *Prionosciadium townsendii;* tubers of *Dahlia coccinea;* bulbs of *Hymenocallis pimana;* flowering stalks and leaf bases of *Agave shrevei;* inflorescences of *Tillandsia erubescens;* and immature cladodes of *Opuntia* spp. were analyzed for proximate and mineral composition. Subterranean organs in general proved high in carbohydrat while fruits were high in fiber. The tree species of *Opuntia* varied considerably in composition although all were high in carbohydrates, fiber, calcium, and magnesium. Mineral contributions of native teas made from shoots of *Tagetes lucida, T. filifolia, Holodiscus dumosus,* and *Elytraria imbricata,* and from root xylem of *Ceanothus depressus* and *Phaseolus ritensis* were also investigated; both the plant material and the watery infuson were analyzed. Results indicate that varying amounts of mineral diffused from the plant material into the aqueous solution. Three condiments were also analyzed for mineral content, i.e. *Monarda austromontana, Hedeoma patens,* and *Teloxys abrosioides.*

Edelmira LINARES and Robert BYE, Jardín Botánico, Universidad Nacional Autónoma de México, México, DF

FUNDAMENTAL PLANTS USED IN THE TREATMENT OF FOUR ILLNESS CATEGORIES IN MEXICO

In order to determine the plants used most frequently in a treatment of four major illness categories (cardiovascular, gastrointestinal, renal [& associated female disorders], & diabetic), various markets of Mexico were studied. In each case, the herbal mixtures contain a fundamental set of medicinal plants as well as various additive depending upon the condition of the patient. Based upon a traditional concept of health, satellite ailments are associated with each principal illness and are treated collaterally. The fundamental plants for each illness category include: cardiovascular: *Citrus*, Ternstroemia, Haematoxylum, Agastache, Chiranthodendron, Ipomoea, Valeriana, Taxodium, Juglans;* gastrointestinal: *Marrubium*, Hippocratea, Miatonia, Matricaria*;* renal: *Equisetum, Arctostaphylos, Guazuma, Crataegus, Cyatheaccae,* sensulato; diabetic: *Tecoma, Cecropia.* (* = introduced taxa).

Daniel LOPEZ, Sells, AZ

***MELHOG:* DESERT PLANT OF MANY USES**

Melhog (ocotillo, *Fouquieria splendens)* is an important plant for the Tohono O'Odham tribe of southern Arizona and Sonora, Mexico. The use of the plant for food, shelter, medicine, and ceremonies is a long-standing tradition on the reservation. Beyond its utilitarian purposes, *melhog* has a rich history in folklore among the O'Odham. Curing songs of the medicinemen feature *melhog,* and its use in their most sacred ceremony—children's shrine renewal—has ancient origins. The Tohono O'Odham attitude toward *melhog* typifies their respect for all living things.

The significance of *melhog* in the Tohono O'Odham culture will be discussed in terms of its utilitarian uses, its place in folklore, and its symbolism of the respect for nature that is an underlying premise of the O'Odham way of life.

Guadalupe MALDA and Humberto SUZAN, Instituto de Ecologias y Alimentos, Universidad Autonoma de Tamaulipas

CONSERVATION OF RARE WILD PLANTS IN JAUMAVE TAMAULIPAS

Habitat destruction and over collection of rare wild plants are the major problems for conservation of endangered and threatened cacti; in several cases those endangered speices are also useful as food or medicine. Because the involvement of rural communities seems the only viable solution for the rescue and *in situ* conservation of those species, the creation of rural nurseries in cooperation with the people was developed as an option for conservation and management of these resources. An exemplary program at Jaumave Valley is presented. The program includes research in the following fields: environmental education; ethnobotanical studies; micro and macropropagation; germination response studies; and a demographic plant monitoring study for selected species. Progress in each, over the last three years is summarized.

D.B.S. MAXWELL, Department of Anthropology, University of Arizona, Tucson, AZ

SUGGESTIONS FOR FUTURE RESEARCH IN THE DETERMINATION OF SEASON OF COLLECTION OF MARINE BIVALVES

Modern comparative collections have come to be an essential part of season of collection (seasonality) studies which deal with shellfish. However, collections are usually compiled in haphazard fashion. This paper is intended to provide a means of standardization. Strategies for compiling modern comparative collections will be offered, including methods for sampling and examining small-scale regional variation. Suggestions will be made regarding size ranges of animals useful for study, based on a pilot study of time involved in specimen preparation, and rates of fracturing during specimen preparation.

Brien MEILLEUR, Bishop Museum, Captain Cook, HI, and
Vincent LEBOT and Richard MANSHARDT, University of Hawaii at Manoa.

THE HAWAIIAN CULTIVARS PROJECT

Fundamental features of traditional Hawaiian culture and agriculture, the cultivated varieties of banana, bottle gourd, kava, sugar cane, sweet potato, taro and yam represent potentially key data in the study of the Polynesian adaptation to the ecologically diverse Hawaiian archipelago. Last significantly investigated over 50 years ago, the Hawaiian cultivars have been under-utilized in recent work on Hawaiian human ecology because of poor linkages between published ethnographic, linguistic and agronomic information and the living material itself. This paper will describe several experimental methods for establishing accurate links between Hawaiian cultivars and existing ethnographic information, regrettably, something only a handful of Hawaiians are now able to do. We will present preliminary laboratory results from isozyme electrophoresis as applied to three Hawaiian crops: banana, kava, and taro. This, and complimentary characterization techniques, when combined with ethnographic analysis, should lead to resolution of much present confusion in Hawaiian cultivar uses and naming, and potentially to improved understanding of intraspecfic crop diversity in Polynesian adaptive processes.

Richard Alan MILLER, Northwest Botanicals, Inc., Grants Pass, OR

NATIVE PLANTS OF COMMERCIAL IMPORTANCE

Among the wild plants of North America are many which have long been used in the medicinal, cosmetic, food, and floral industries. Some of them are used in sufficient quantities to make them commercially important. The collection of plants or plant parts for these markets has long provided gainful employment for many people living in the rural sections of the United States. A book has been prepared to describe these and other forest products, dividing the United States into five regions: Northeast, South, Midwest, Southwest, and the Northwest. Detail in marketing is described. Each region contains a description of ten

common crops now harvested, with suggestions on additional crops which might have markets developed in the next several years. Reforestation is stressed to make each crop renewable and self-generating as a natural resource. This technique has led to the new concepts of forest farming. The future of foraging as a source of supplementing one's rural income lies with our ability to recognize natural resources.

Felipe S. MOLINA, Yaqui Family Literacy Program, Tucson, AZ,
Richard S. FELGER, Drylands Institute, Tucson, AZ and
William B. STEEN, Elgin, AZ

PLANTS AND ANIMALS IN YOEME RELIGIOUS CELEBRATIONS: EDUCATIONAL GOALS

Numerous plants and animals form an integral part of Yoeme (Yaqui) religious celebrations, both in Arizona and Sonora. Many Yoeme have great respect for the plants and animals in the *Huya Ania* (wilderness world) because each plant and animal has a *hiapsi* (soul or heart), so that is why they are a part of the ceremony. Although many adult and young people have gaps in traditional knowledge, they show a strong interest in learning about plants and animals in Yoeme ceremonies. A major topic often voiced at community meetings is concern over loss of traditional information. Our project addresses this concern by assisting in the development of classroom curriculum materials, in both Yoeme and English, and ultimately in presenting the information in usable printed form.

Felix MORALES P., Direccion General de Culturas Populares, Unidad Regional Oaxaca, Mexico

THE TECHNOLOGY OF TRADITIONAL AGRICULTURE IN SAN CRISTOBAL LACHIROAG, OAXACA, MEXICO

In this work we describe and record the Zapotec technology and the tools used in traditional agriculture. In the same time we are looking at the customs that involve cultivating plants; how the myths, costumes, and other factors may affect the activities of these people as well as how these traditional ways can be encouraged and promoted. This is also an account of the natural resources and land improvements both in the past and today. We also include the times of abundance and the economic implications of these seasonal fluxes.

F. David MULCAHY, Polytechnic University, Brooklyn, NY

RARE MEDICINAL USES OF *GLYCYRRHIZA GLABRA*

Glycyrrhiza glabra or Mediterranean licorice is one of the most ancient and widely used Old World medicinal plants. Today, as in antiquity, it is usually prescribed as an expectorant, respiratory demulcent and flavoring agent for other medications. Some of the less frequent medical uses of the plant will be documented from a variety of ancient and modern materia medica. These uses will be discussed in light of recent pharmacological studies of the plant.

Luz Ma. Mera OVANDO, Elia HERRERA TORRALBA, Robert BYE, Miguel Angel MARTINEZ ALFARO and Francisco BASURTO PENA, Jardín Botánico, Universidad Nacional Autónoma de México, México, DF

ETHNOBOTANY AS AN INTERACTIVE COMPONENT IN INTER-DISCIPLINARY STUDIES OF GENETIC DIVERSITY IN BEANS *(PHASEOLUS,* FABACEAE) OF MEXICO

Most of the species of the New World genus *Phaseolus* (frijol) are concentrated in Mesoamerica. Over 90% of the wild species and the four principal domesticated species (*P. acutifolius* Gray, *P. coccineus* L., *P. lunatus* L., and *P. vulgaris* L.) are native to Mexico. The genotypic variation that has been produced over thousands of years through natural selection, domestication, adaptation to ecological niches of differenct production regions, and varying cultural preferences related to consumption qualities must be evaluated through interdisciplinary studies with common global objectives. Ethnobotany, taxonomy, genetics and ecophysiology are complements of our current research program on the genetic diversity of Mexican wild and domesticated beans. Preliminary results from studies of different subspecies of *P. coccineus* (scarlet runner bean, ayocote, tekomari) from the Sierra Norte de Puelba (Puebla) and Sierra Tarahumara (Chihuahua) are presented.

Kristina PETERSEN, Brigham Young University, Provo, UT

THE DUTCH MONOPOLY OF NUTMEG

In the mid 17th century, the Dutch East Indies Company established a monopoly on the nutmeg tree, *Myristica fragrans,* which was world renown as the source of the highest quality nutmeg. For approximately 150 years, they successfully controlled the trade of this important spice by restricting the growth of this nutmeg species to two islands, Ambon and Banda, located in the Moluccas. The monopoly was finally broken in the late 18th century when an inferior nutmeg was successfully substituted and traded in place of *M. fragrans* which resulted in the ultimate bankruptcy of the company. *M. fragrans* is still grown on Ambon and Banda and is exported for use as a spice, a preservative and, in some cultures as a drug.

Gayle POTTER-BASSO, Heber, AZ

A PLANT FOR ALL SEASONS: *YUCCA BACCATA* IN WESTERN APACHE CULTURE

The Western Apache of Arizona have incorporated *Y. baccata* into almost every area of their culture. This plant is utilized in a host of ways, from a form of dental floss to an active agent in returning celestial bodies to their correct positions following eclipses. In addition, it may be employed as food, soap, paint, and rope; it holds cradleboards and homes together; it protects people and horses from sickness and misfortune. This paper, which is based on current ethnographic research in a community on the Fort Apache Reservation, and also incorporates materials gathered in the 1930s will demonstrate that Western Apache history, ideology, and society are all symbolically "present" in this type of yucca.

Karl J. REINHARD, University of Nebraska, Lincoln, NE
POLLEN CONCENTRATION AND COPROLITES: AN APPROACH TO PALEOPHARMACOLOGY

Over 2,000 plant species have been documented ethnographically as having medicinal value among Native Americans. It is, therefore, not surprising that evidence of medicinal plants appears in some of the 1,000 coprolites studied in the southwestern U.S. Pollen concentration is an especially useful technique in identifying use of medicinal "teas." Concentration values (# grains/gram) of coprolites clearly distinguish intentional ingestion of polleniferous materials from unintentional ingestion of ambient pollen.

Three species are discussed. Willow *(Salix)* is the most common analgesic in the Native American pharmacopoeia of coprolites from Bighorn Cave in the Black Mountains of Arizona, and also in a burial from the Mimbres Valley, New Mexico. Mormon tea *(Ephedra)* was used historically as a diuretic, and evidence of its prehistoric use is also present in Bighorn Cave. Creosote *(Larrea)* is an antidiarrheal plant, and evidence of its use has been documented as Caldwell Cave in far western Texas. These remains demonstrate the aniquity of folk remedies, and provide circumstantial evidence of certain disorders suffered by prehistoric peoples.

Elizabeth J. REITZ, Museum of Natural History, University of Georgia, Athens, GA
PATTERNS OF VERTEBRATE USE DURING THE ARCHAIC PERIOD IN PERU

Data from three Archaic sites on the coast of Peru demonstrate that marine vertebrates constituted a substantial portion of the animal-based diet. Marine animals, particularly herrings, anchovies, and pinnipeds, were major resources from 8000 B.C. until at least 3000 B.C. In collections from Carrizal, the Ring Site, and Paloma, marine vertebrates constituted over 90% of the individuals. Marine resources were clearly important in the economies of these early sites.

Beatriz RENDON AGUILAR and Robert BYE, Jardin Botanico, Universidad Nacional Autonoma de Mexico, Mexico, DF
AN ANALYSIS OF TWO INTRODUCED SPECIES IN TRADITIONAL MEXICAN AGRICULTURE: ROSELLE *(HIBISCUS SABDARIFFA* L., MALVACEAE) AND COFFEE *(COFFEE ARABICA* L., RUBIACEAE)

Roselle (jamaica) and coffee (cafe), both African species introduced into Mexico at different times, have adapted to the traditional agriculture and subsistence of the Mexican people. Two studies developed in the state of Guerrero examine these species as components of traditional intercropping agricultural systems. Roselle is grown annually in the polyculture maize fields of the lower deciduous tropical forest. Coffee forms a perennial component of the shrub stratum of the intermediate subdeciduous tropical forests. These management

systems have many ecological and economic advantages from the farmers' viewpoint. Ecologically, they allow *in situ* resource conservation. Economically, they provide a safeguard against losses due to price fluctuation of the products in the national market.

Maricela RODRIGUEZ-ACOSTA and Martha LINARES,
Universidad Autonoma de Puebla, Mexico, Puebla, Pue., Mexico
STUDY OF THE USEFUL FLORA FROM THE MUNICIPALITY OF TECALI DE HERRERA, PUEBLA, MEXICO

This study is part of the project "Useful flora from the states of Puebla and Tlaxcala," in Mexico. The municipality of Tecali de Herrera is located southeast from the city of Puebla with an altitude of approximately 2,100 meters above the level of the sea. It has a humid and temperate weather with summer rains and a prominent calcareous soil. The vegetation includes xerophytic bushes and some regions with oak woods. There, 232 different species were found. From these, 190 are used in 24 categories. The most important uses are: forage, fuel, food, ornamental, building materials, alive fences, melliferous, work instruments, shadow and condiment. Medicinal plants are employed for 70 therapeutic uses. The use of the flora is considered to be very high in the area of study, since only 39 species out of 190 are cultured, while the rest correspond to the wild flora.

Guenter ROSE and Anne BOETTCHER, Bowdoin College, Brunswick, ME
THE EFFECT OF *SOLANUM NIGRUM* ON SLEEP-AWAKE EEG, VISUAL EVOKED POTENTIALS, AND BEHAVIOR IN RATS

Solanum nigrum has many indigenous medicinal uses worldwide, some of which, as in the treatment of pain, involve the CNS. In Sri Lanka it is used as a folk remedy to reduce nightmares, especially in children. This preliminary study demonstrated significant changes in both neurophysiological and behavioral parameters as a function of plant extract dosage.

In normals and control (sterile water) rats, the percentage of awake versus sleep EEG was 20–25% and 75–80% respectively, with the majority of totol recording time (3 hours) spent in slow wave sleep (55–60%). During sleep, time spent in SWS versus REM was 77% versus 22%. Depending on dosage, intraperitoneal injection of extract shifted percent time to 100% wakefulness at high doses (1.0 gm/kg), to lower percentages at lower doses accompanied by emerging SWS, but continued REM suppression. Whereas most of the EEG during normal wakefulness was the alert type (65–75%), in experimentals this shifted to quiet awake EEG (maximum of 88%), accompanied by depression of behavioral activity, and evoked potential waveform changes.

Roy A. SALLS, California State Univeristy, Northridge, CA
ZOOARCHAEOLOGY OF THE SECRET TOLACHE CULT RITUALS

Zooarchaeological research applied to the ethnographical data of the Indians of Southern California has revealed that much of the information obtained by ethnographers on the prehistoric Indian culture is hopelessly mixed with that

of the Indians of northwest Mexico as well as being influenced by European value standards. Recent faunal evidence from San Clemente Island, California appears closer to the Spanish chronicles than it does the early 20th century ethnographies of the "Eagle Ceremony." The most intriguing aspect of the faunal data is ritual canid dismemberment utilizing dogs and foxes in the same manner as the birds in the so-called Eagle Ceremony. Evidence for the canid ceremony can be found throughout Southern California dating back possibly to 9000 B.C. but only recently recognized as an important ritual. Even more important is that this ceremony has never been recorded and is either unknown to living ancestors or has been their most successfully kept secret.

Silvia SANTAELLA and Estela ZARATE, D.G.C.P., Unidad Regional Oaxaca, Oaxaca, Mexico

BREEDING SILKWORMS *BOMBYX MORE* L. IN THE NORTHERN SIERRAS OF OAXACA, MEXICO

In this work we present data to show the breeding of the silkworm *Bombyx mori* L. in the Cajonos region of the Northern Sierras of Oaxaca. We discuss the life cycle, the community size studied as well as the preparation of the silk and manufacture of the cloth.

Ulrike SCHACHT and Michael EILBRECHT, Technical University of Berlin, West Germany

A THEORY FOR DEVELOPING A NATURAL METHOD OF LANDSCAPE PLANNING

The connection between using natural resources, limitations and traditions can be demonstrated as a foundation for generating a natural method of landscape planning as exemplified by the Chatinos, an indigenous folk in the Sierra Madre del Sur of Oaxaca, Mexico.

Brian S. SHAFFER, Texas A&M University, College Station, TX

QUARTER-INCH SCREENING: UNDERSTANDING BIASES IN RECOVERY OF FAUNAL REMAINS TO AUGMENT ZOOARCHAEOLOGICAL INTERPRETATION

Fine-screening of archaeological materials has often proven to be too expensive and too time consuming for large assemblages and so ¼" has become the standard size of mesh to use. Unfortunately, little work has been conducted in documenting the effects of ¼" screening on bone recovery and the resulting biases in interpretations that may result. Previous research indicates that ¼" screening does bias sample recovery, but this research has not documented the biases in recovery and loss of specific elements for specific taxa. To better understand these biases, tests were conducted on 24 species of modern mammals. Results of these tests indicate that recovery and loss of specific elements for each taxon can be anticipated. Provided with this information, the zooarchaeologist can better understand the composition of the assemblage being analyzed and will therefore be better prepared to interpret the data.

G.K. SHARMA, University of Tennessee, Martin, TN
ENVIRONMENTAL POLLUTION: A TRAGEDY IN SHANGRI-LA

The Himalayas, extending from Afghanistan to Burma, represent a delicate ecological complex with connotations of an idyllic retreat for human spirit and contemplative asceticism. Environmental pollution, deforestation, and agricultural practices have greatly disturbed the ecological balance of this fragile ecosystem. The burning of fossil fuel in the plains of the adjoining areas has contributed to the particulate and gaseous contamination of this pristine habitat. The vegetation, human health and resources, and lifestyle of the local inhabitants have been affected. Some of the rare plant species of the area are endangered. Cereal crops have reduced yields and in the absence of proper direction, the local inhabitants have started migrating to the plains of the neighboring states. This exodus has affected the folklore and ethnobotanical knowledge so critical to the economic and medicinal treasure-trove of the area. Research was funded by the Rotary International and the University of Tennessee, Martin, Tennessee.

Wade C. SHERBROOKE, Southwestern Research Station, American Museum of Natural History, Portal, AZ
HORNED LIZARDS: RECURRENT IMAGES FROM SOUTHWESTERN PEOPLES

Images representing horned lizards (''horny toads;'' genus *Phrynosoma)* have been used for centuries by successive culture groups occupying the western United States and Mexico—the only region in which these unique lizards occur. Their representational use by Anasazi, Hohokam, Mogollon, and Casa Grande cultures is illustrated. Information from the archaeological record is being compiled from museum collections and from published reports. Published ethnographic reports are being examined for references to horned lizards; these came from diverse cultures, including Navajo, Piman, and Zuni. Modern crafts of Native American and other Southwestern artists that incorporate horned lizard designs are displayed. These demonstrate the continuing multicultural fascination that these creatures have aroused amongst inhabitants of the Southwest.

Shawn SIGSTEDT, Harvard University, Cambridge, MA
THE PROTECTION OF INDIGENOUS CULTURES BY THE PRESERVATION OF ECOSYSTEMS

Today there is widespread recognition for the need to maintain wilderness areas and natural ecosystems by the preservation of lands, organisms, and processes of evolutionary change. There is also a growing recognition for the need to maintain natural ecosystems for the protection of indigenous cultures. Throughout the world concerns are being voiced by indigenous people for the preservation of their historical, ethnobiological, and medicinal plant heritage by the protection of the natural ecosystems through which their cultures emerged by the formation of parks where sustainable harvest of natural products may continue into perpetuity. Many of these cultural lands and ecosystems are being

threatened by rapid development and habitat destruction due to economic incentives for short term gain. Over participation in new market economies include high risks that indigenous cultures will lose their knowledge and traditions. Such traditions are often based on results of centuries of accumulated observations, and extended experimentation by these isolated "island-like" cultures within their diverse ecological communities. In the larger view we all run the risk of losing our global heritage of the diversity of human cultures, and the organisms they evolved with, as a result of these losses of biological diversity.

Shawn SIGSTEDT, Harvard University, Cambridge, MA
BEAR MEDICINE: "SELF-MEDICATION" BY ANIMALS

There is growing evidence that medicinal plants may be used by animals. Observations suggesting "self-medication" by animals have brought into speculation a potential role of animals in the human discovery of medicinal plants. In this paper, the medicinal plant *Ligusticum porteri,* (Osha', Bear Medicine, Na'Bi), is examined to investigate a possible relationship between humans and animals in the discovery of medicinal plants. American Indian legends are discussed which tell that this medicinal plant, *Ligusticum porteri,* was originally a gift from the Bear to the human beings for use as medicine. Present captive-bred bear observations suggest a biological basis for such legends. Recommendations for the protection of historical lands and natural ecosystems hosting these organism and medicinal plants, and ultimately for the preservation of human cultures, are discussed.

Daniela SOLERI, Seeds/SEARCH, Tucson, AZ
A PRELIMINARY SURVEY OF HOPI CROP REPERTOIRES AND IMPLICATIONS FOR IN SITU CONSERVATION OF CROP GENETIC RESOURCES

A preliminary survey of the crop repertoires of 50 Hopi farmers found abandonment of some traditional or folk varieties, however a large number of folk varieties are still grown and comprise the majority of crop varieties in those farmer's repertoires. Retention of Hopi folk varieties or adoption of new, non-Hopi varieties was observed to vary both between crops and between crop varieties in ways which suggest a complex combination of cultural and environmental reasons for the composition of crop repertoires.

The findings also demonstrate that the Hopi farming system is an example of *in situ* conservation of crop genetic resources. This research and further collaborative work with knowledgable Hopi farmers could provide insights useful to supporting these and other farmers' and communities' efforts to conserve their crop genetic heritage in ways which they see as appropriate and useful.

Carlos Solorzano TELLO, Aristides SUASTEGUI R., and Miguel A. MARTINEZ ALFARO, Jardin Botanico del IB-UNAM, Apdo. Postal 70-614, Coyoacan 04510, Mexico, D.F.
THE AMPHIBIANS AND REPTILES AMONG THE TOTONAC INDIANS OF HUEHUETLA, PUEBLA, MEXICO

Despite the ecological deterioration in the Sierra Norte de Puebla, the Totonac Indians of Huehuetla maintain a broad knowledge of the local flora and fauna

and, hence, have a rich biological perception of their environment. The Totonac biological universe consists of several parts that are strongly integrated and in continuous motion. Natural ethnotaxa include chichakys *(Anura),* xcolulo *(Lacertidae),* kagayam (turtles), sarampitpit (salamanders), Luwua (snakes and certain arthropods and mollusks). These animals are important as mythological elements in Totanac cosmovision. Information derived from field work demonstrate their role in economic utility, ecological degradation and environmental integration. Because of the socioeconomic marginality of indigenous groups, the Totonac people are undergoing transculturation thus provoking changes in their concepts of fauna by incorporating western elements.

Ellen SPEISER and Dominique IRVINE, Cultural Survival Inc., Menlo Park, CA
RUNA: GUARDIANS OF THE FOREST

Runa: Guardians of the Forest centers on a single community of Runa (lowland Quichua) Indians in the Loreto area of the Ecuadorian Amazon. The film portrays both sides of their life at present: the traditional knowledge and practices that form the core of their adaptation to the rainforest, and their reactions and adjustments to the larger society, which is quickly impinging on their community. The profound ecological knowledge of native peoples like the Runa offers hope for a successful adaptation to the rainforest in the future. This message is conveyed by the Runa themselves, who contributed to and guided the filming. The film depicts the complete cycle of forest use and management practiced by the Runa ranging from the planting of crops in swidden agricultural plots to the protection and planting of trees in managed fallows to the use of tree species found in mature forests. Game management and the protection of fishery resources are also illustrated.

Aristides SUASTEGU, Carlos GONZALEZ and Miguel A. MARTINEZ, Jardin Botanico, Universidad Nacional Autonoma de Mexico, Mexico, DF
ETHNOZOOLOGICAL NOTES ON TOTONACS FROM HUEHUETLA, PUEBLA, MEXICO

The Totonac Indians of Huehuetla, Puebla, have a strong knowledge on the regional fauna. In this paper we show information on herpetological aspects (frogs, toads, snakes, and salamanders). This ethnic group has many myths about these animals. Several symbols in relation with the cultural origins are an important source on the nature's perception. This paper shows such vinculation between the natural and culture across the oral history in a town with such traditions. The town is isolated and only is reached by animal transport or walking.

Mark TAPER, Department of Biology, University of New Mexico, Albuquerque, NM and **Christine FRANQUEMONT,** Department of Anthropology, Cornell University, Ithaca, NY.
MUSHI NO HI, THE DAY OF THE INSECT
THE FUNCTION OF RITUAL IN JAPANESE BIOLOGY

The government of Japan has built a new Science City at Tsukuba to encourage scientific research and development. At a government research institute on

environmental sciences, the annual Mushi No Hi ritual is held to honor the souls of the insects sacrificed to science during the preceding year. The authors investigated the context of this ritual and researchers' beliefs about it. Variation in the accounts given show that the ritual serves multiple social and scientific functions beyond religious meaning. As a social event bringing together scientists in a single discipline from the entire range of institutions of the area, the ritual disrupts the rigid system of institutional parallelism characteristic of Japanese society. The dedication of a stone monument established a senior/junior relationship for this new, seemingly orphan institute. The event demonstrates that the need for traditions leads the scientists in the new city to emphasize and invent a tradition tying them into the religious and scientific history of Japan.

Jan TIMBROOK, Santa Barbara Museum of Natural History, Santa Barbara, CA

USE OF *YUCCA WHIPPLEI* BY THE SOUTHERN CALIFORNIA INDIANS

The chaparral yucca or Spanish bayonet, *Yucca whipplei,* occurs in the coastal mountains of southern California and inland to the margins of the Mojave Desert. Several Native American peoples made considerable use of this plant, particularly as a source of food. Although in some ways it might be regarded as an agave equivalent, yucca had its own distinctive patterns of usage and classification. This paper surveys use of *Yucca whipplei* by the various Indian groups in whose territory it occurs, with particular attention to the Chumash. Possibly indicating its cultural significance, Chumashan languages have extensive terminology for different parts of the plant in raw, cooked, fresh and dry states.

Mollie S. TOLL and Pamela MCBRIDE, Department of Biology, University of New Mexico, Albuquerque, NM

OPPORTUNITIES FOR INVESTIGATING BROAD-SCALE PATTERNS OF HUMAN IMPACT ON THE SEVILLETA LONG-TERM ECOLOGICAL RESEARCH PROJECT, SOUTHERN NEW MEXICO

A remarkable data base currently being generated for the NSF-funded Sevilleta LTER will allow integration of human impact data with environmental variables on a broad scale and level of precision heretofore only dreamed of by ethnobiologists. The distribution of archaeological sites over time and space will be included because it can provide a very specific record of human adaptive response to known paleoclimatic flux and other aspects of prehistoric and historic landscape, a record not available for any other organism. Data bases include plant demography and physiology, mammals, invertebrates, soils, hydrology, landforms, weather, and landscape characterization. Technical back-up for the Sevilleta LTER includes the GIS mapping system, digitized satellite and balloon imagery, and FTIR and LIDAR (instrumentation designed to measure the flux of biogenic gas emissions such as carbon fixation, respiration, evapotranspiration, and denitrification, over pathlengths up to 1 km). Ethnobiologists should be aware of this exceptional research opportunity in the early stages of this project, due to run 20 years or longer.

Jaime TORTORIELLO GARCIA, Biomedical Research Unit in Traditional Medicine and Drug Development, IMSS, Xochitepec, Morelos, Mexico

PHARMACOLOGICAL EVALUATION OF FOLKLORE USE OF *GALPHIMIA GLAUCA*

Aerial parts of *Galphimia glauca* commonly known as "calderona amarilla" have been for since many years in the treatment of mental disorders and as a nerve sedative in Mexican folk medicine. Four kg of dried aerial parts of the plant were collected in Dr. Mora, a town of Guanajuato, Mexico, in the fall of 1989, and extracted overnight maceration in petroleum ether, then with hexane and finally in methanol. Hexanic and methanolic extracts were tested in 4 pharmacological systems: potentiation of narcotics, in which both extracts increased pentobarbitone sleeping time; anticonvulsivant activity, in which both extracts produced a small increase in the latency of threshold convulsion, avoiding seizures and death; modification of body temperature in rats, where a significant decrease in temperature was obtained with both extracts; and electrically-stimulated guinea-pig ileum, in which dose-response curves were obtained with both extracts, producing a decrease of tissue contraction.

Nancy J. TURNER and Richard J. HEBDA, Royal British Columbia Museum, Victoria, B.C.

CHILCOTIN (TSILHQUT'IN) ETHNOBOTANY

The Chilcotin (Tsilhqut'in), an Athapaskan group of central British Columbia, retain much of their traditional economy based on hunting, fishing and gathering plants. In 1988 we undertook preliminary field interviews and literature search to document the role of plants in Chilcotin language and culture. Chilcotin elders and younger band members recognized and named about 100 different types of indigenous plants. Many plants are still used today.

Important species are: *Claytonia lanceolata* and *Erythronium grandiflorum* ("root foods"); *Pinus contorta* (inner bark eaten); *Heracleum lanatum* (green vegetable); *Amelanchier alnifolia, Fragaria virginiana, Ribes irriguum, Rubus idaeus, Shepherdia canadensis, Vaccinium caespitosum* and *V. membranaceum,* (fruits); *Ledum groenlandicum* (tea); *Veratrum viride* and *Cicuta douglasii* (toxic plants); *Betula occidentalis* (wood, bark fiber); *Juniperus scopulorum* (wood, scent, medicine); *Picea glauca* (wood, pitch source, medicine); *Populus balsamifera* (wood); *Salix* spp. (wood); *Elaeagnus commutata* (fiber); and *Urtica dioica* (medicine). Some Chilcotin plant names (e.g. "grass," "spruce") are cognate with those of distant Athapaskan languages such as Chipewyan and Navajo.

Ana Guadalupe VALENZUELA, Tequila Sauza, S.A., Guadalajara, Jalisco, Mexico

AGROECOLOGICAL INVESTIGATIONS OF THE BLUE TEQUILA AGAVE, *AGAVE TEQUILANA* WEBER

The cultivation of the blue tequila agave, *Agave tequilana* Weber, offers an important agroecological alternative in the hot zones of "Nueva Galicia" in

western Mexico. In the state of Jalisco in particular, this crop ecology system has not been given the attention it deserves from scientific investigators, perhaps due to its narrow regionality. Beginning in 1987, Tequila Sauza initiated a wide range of agroecological investigations concerning the diseases, insect ecology, fertilization responses, appropriate intercrops, and economic investments in tequila fields. Research collaboration with University of California at Los Angeles and other institutions has already yielded useful results.

Willard VAN ASDALL, University of Arizona, Tucson, AZ
ETHNOBIOLOGICAL ASPECTS OF NEW AGE HEALING: AN ALTERNATIVE MEDICINE APPROACH

In 1970, Andrew Weil published a paper which dealt with, in part, the ethnobotany of an American subculture, the "Hippie" generation. This paper looks at another emerging subclulture—those who embrace and endorse New Age principles and concepts. During the past decade or so there has been increasingly greater interest in alternative medicine and healing. Some of the modalities have been revivals and modifications of ancient healing arts and others have been formulated relatively recently. Many of the modalities include an expanded view of the human condition and many use, for example, flower essences and essential oils for redressing imbalances in the physical, mental, and emotional systems of human beings. In this paper, some of the expanded views of the human condition and selected healing modalities will be discusssed.

Luz Elena VASQUEZ DAVILA, Universidad Autonoma Benito Juarez de Oaxaca and **Marco A. VASQUEZ DAVILA,** Centro de Ecodesarrollo, A.C.
ETHNOBOTANY OF DYEING PLANTS OF THE ZAPOTECS OF OAXACA, MEXICO—I. SANTA ANA DEL VALLE.

The Zapotecs of Santa Ana del Valle (a town situated at the Northeast of Oaxaca City and at 1780 feet above the sea level) have been known by their beautiful wool rugs, dyed with natural colors. To dye the wool, the Zapotec Indians of this town employ barks, leaves, flowers, fruits or the complete plant. They gather these materials in the ecosystems near the town. This study describes the use of dyeing plants and the general process of rug weaving.

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ETHNOECOLOGY OF THE GREAT KISKADEE (AVES: TYRANNIDAE) IN TABASCO, MEXICO

This study was undertaken in Tabasco, situated in Southeast Mexico in the Neotropical region characterized by rain forests, grasslands, wetlands and mangroves. This paper describes that the great kiskadee *Pitangus sulphuratus* is a conspicuous organism in the diverse ecosystems and it is known very well by the Chontal Indians (of the Maya linguistic family) and by the mestizo peasants. They both respect this bird that disperses the chili pepper seed *Capsicum annum*

var. *glabriusculum*. In this study, we make an ethnoecological and linguistic analysis about the biological perception of both social groups concerned with man-animal-plant relationships.

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ETHNOBOTANICAL ASPECTS OF PAPALOQUELITE

With the objective of documenting the importance of *Porophyllum ruderale* (Jacq.) Cass. subsp. *macrocephalum* (DC.) R.R. Johnson since the pre-Conquest period, ethnobotanical information was compiled from archaeological, historical and contemporary sources. In Mexico, various taxa of the genus *Porophyllum* are called papaloquelite. This name is derived from the Nahuatl terms ''papalo''—'butterfly' and ''quiltil''—'edible green'. The earliest available written records about the utilization of this plant are found in the 16th century codices which emphasized their medicinal and edible properties. Today, papaloquelite is employed widely as a condiment in central Mexico. *Porophyllum ruderale* subsp. *macrocephalum* in particular is involved in an active domestication process. The Mexican farmers (campesinos) intereact with this plant at different levels ranging from gathering it from wild populations to cultivating it and selecting different forms.

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A COMPUTER-BASED PROGRAM AND DATA BASE FOR MEDICINAL PLANTS

This paper reports on the development and use of two programs on the MacIntosh computer with the Hypercard program for ethnomedical and ethnopharmacological data. The program, developed with the technical assistance of the ASU Hispanic Research Center, provides a number of benefits in utilizing, organizing and presenting information on medicinal plants and their biochemical and pharmacological characteristics. The programs are specialized for data on: 1—traditional plant use; and 2—data on biochemical and pharmacological properties. The program is interactive and ''user-friendly'' with visual prompts or categories of information and types of responses. Program properties permit: 1—input of data from other text files; 2—searches on any aspect of the data (e.g., common or botanical plant names, ecological zone, plant use, pharmacological properties, biochemical constituents, etc.); and 3—selective compilation of data into new text files. This presentation provides a demonstration of its use in the development of ethnomedical data relevant to the utilization of medicinal plants in the treatment of diabetes among Native American groups.

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AN OVERVIEW OF PREHISTORIC AND HISTORIC TOBACCO DISTRIBUTION IN NORTH AMERICA

This paper summarized the archaeological and ethnographic data concerning the use of four species of tobacco in North America: *Nicotiana rustica, N. attenuata,*

N. trigonophylla, and *N. quadrivalvis.* The remains of all four have been found in archaeological contexts, with *N. rustica* recovered from sites in the East, Southeast, and Southwest; *N. attenuata* and *N. trigonophylla* in the Southwest; and *N. quadrivalvis* in the upper Midwest. Comparisons between the prehistoric and historic occurrences of tobacco are made, and questions are raised about the cultural and ecological role of tobacco among Native American societies.

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RECONSTRUCTION OF PLANT RESOURCES OF HUNTER-GATHERERS ALONG THE WESTERN MARGIN OF THE GULF COAST AND THE TAMAULIPAN BIOTIC PROVINCE

The floral resources utilized by Archaic and Late Prehistoric hunter-gatherers along the western margin of the Gulf Coast and the Tamaulipan biotic province are not well known because environmental conditions are not conducive for preservation of botanical remains. In spite of these difficulties, the integration of three key data sources provides a unique opportunity to reconstruct plant resources and potential plant resources of the area. These components include charcoal and seed remains recovered from archaeological sites, ethnohistoric accounts, and modern surveys of the vegetation. The present study reviews the data base formed by the integration of each of these components, and discusses the problems which must be considered.